



6560-50-P

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 51

[EPA-HQ-OAR-2010-0605; FRL-9679-2]

RIN 2060-AQ38

Air Quality: Revision to Definition of Volatile Organic Compounds – Exclusion of trans-1,3,3,3-tetrafluoropropene

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: This action revises the EPA's definition of volatile organic compounds (VOCs) under the Clean Air Act (CAA). This revision adds trans-1,3,3,3-tetrafluoropropene (also known as HFO-1234ze) to the list of compounds excluded from the definition of VOC on the basis that this compound makes a negligible contribution to tropospheric ozone formation. As a result, if you are subject to certain federal regulations limiting emissions of VOCs, your emissions of HFO-1234ze may not be regulated for some purposes. This action may also affect whether HFO-1234ze is considered a VOC for state regulatory purposes, depending on whether the state relies on the EPA's definition of VOC.

DATES: The final rule is effective on **[INSERT DATE 30 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER]**.

ADDRESSES: The EPA has established a docket for this action under Docket ID No. EPA-HQ-OAR-2010-0605. All documents in the docket are listed on the www.regulations.gov website. Although listed in the index, some information is not publicly available, i.e., confidential business information (CBI) or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, will be publicly available only in hard copy. Publicly available docket materials are available either electronically in www.regulations.gov or in hard copy at the Docket ID No. EPA-HQ-OAR-2010-

0605, EPA/DC, EPA West, Room 3334, 1301 Constitution Avenue, Northwest, Washington, D.C. The Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566-1744, and the telephone number for the Docket ID No. EPA-HQ-OAR-2010-0605 is (202) 566-1742.

FOR FURTHER INFORMATION CONTACT: David Sanders, Office of Air Quality Planning and Standards, Air Quality Policy Division, Mail Code C539-01, Research Triangle Park, NC 27711; telephone: (919) 541-3356; fax number: 919-541-0824; email address: sanders.dave@epa.gov.

SUPPLEMENTARY INFORMATION:

I. General Information

A. Does this action apply to me?

Entities potentially affected by this final rule include, but are not necessarily limited to, states (typically state air pollution control agencies) that control VOCs, and industries involved in the manufacture or use of refrigerants, aerosol propellants and blowing agents for insulating foams. Table 1 is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be affected by this action. This table lists the types of entities that the EPA is now aware of that could potentially be affected by this action. Other types of entities not listed in the table could also be affected. If you have questions regarding the applicability of this action to a particular entity, consult the person listed in the preceding FOR FURTHER INFORMATION CONTACT section. This action has no substantial direct effects on industry because it does not impose any new mandates on these entities, but, to the contrary, removes HFO-1234ze from the regulatory definition of VOC.

TABLE 1—POTENTIALLY AFFECTED REGULATED CATEGORIES AND ENTITIES

Industry group	SIC ^a	NAICS ^b
Refrigerants	2869, 3585	238220, 336111, 336391

Aerosol propellants	2869	325998
Blowing agents	2869, 3086	326140, 326150

^a Standard Industrial Classification.

^b North American Industry Classification System.

The use of this compound remains subject to other restrictions under the CAA. Specifically, the use of this compound as an aerosol propellant, blowing agent, or refrigerant or any other use in which it would substitute for chlorofluorocarbons, hydrochlorofluorocarbons, or their substitutes, is subject to regulation under the Significant New Alternatives Policy (SNAP) program (CAA §612; 40 CFR 82 subpart G). The SNAP program has issued final listings for HFO-1234ze as an acceptable foam and refrigerant substitute and as an aerosol propellant (74 FR 50129, September 30, 2009; 75 FR 34017, June 16, 2010).

B. How is this preamble organized?

The information presented in this preamble is organized as follows:

I. General Information

- A. Does this action apply to me?
- B. How is this preamble organized?

II. Background

- A. The EPA's VOC Exemption Policy
- B. Petition to List HFO-1234ze as Exempt

III. Proposed Action and Response to Comments

IV. Final Action

V. Statutory and Executive Order Reviews

- A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review
- B. Paperwork Reduction Act
- C. Regulatory Flexibility Act
- D. Unfunded Mandates Reform Act
- E. Executive Order 13132: Federalism
- F. Executive Order 13175: Consultation and Coordination with Indian Tribal Governments
- G. Executive Order 13045: Protection of Children from Environmental Health and Safety Risks
- H. Executive Order 13211: Actions that Significantly Affect Energy Supply, Distribution or Use
- I. National Technology Transfer and Advancement Act
- J. Executive Order 12898: Federal Actions to Address Environmental Justice in Minority

- Populations and Low-Income Populations
- K. Congressional Review Act
- L. Judicial Review

II. Background

A. The EPA's VOC Exemption Policy

Tropospheric ozone, commonly known as smog, is formed when VOCs and nitrogen oxides (NO_x) react in the atmosphere in the presence of sunlight. Because of the harmful health effects of ozone, the EPA and state governments limit the amount of VOCs that can be released into the atmosphere. The VOCs are those organic compounds of carbon which form ozone through atmospheric photochemical reactions. Different VOCs have different levels of reactivity – that is, they do not react to form ozone at the same speed or do not form ozone to the same extent. Some VOCs react slowly or form less ozone; therefore, changes in their emissions have limited effects on local or regional ozone pollution episodes. It has been the EPA's policy that organic compounds with a negligible level of reactivity should be excluded from the regulatory VOC definition so as to focus VOC control efforts on compounds that do significantly increase ozone concentrations. The EPA also believes that exempting such compounds creates an incentive for industry to use negligibly reactive compounds in place of more highly reactive compounds that are regulated as VOCs. The EPA lists compounds that it has determined to be negligibly reactive in its regulations (at 40 CFR 51.100(s)) as being excluded from the definition of VOC.

The CAA requires the regulation of VOCs for various purposes. Section 302(s) of the CAA specifies that the EPA has the authority to define the meaning of "VOC," and hence what compounds shall be treated as VOCs for regulatory purposes. The policy of excluding negligibly reactive compounds from the VOC definition was first laid out in the "Recommended Policy on Control of Volatile Organic Compounds" (42 FR 35314, July 8, 1977) and was supplemented most recently with

the “Interim Guidance on Control of Volatile Organic Compounds in Ozone State Implementation Plans” (Interim Guidance) (70 FR 54046, September 13, 2005). The EPA uses the reactivity of ethane as the threshold for determining whether a compound has negligible reactivity. Compounds that are less reactive than, or equally reactive to, ethane under certain assumed conditions may be deemed negligibly reactive and therefore suitable for exemption from the VOC definition. Compounds that are more reactive than ethane continue to be considered VOCs for regulatory purposes and therefore subject to control requirements. The selection of ethane as the threshold compound was based on a series of smog chamber experiments that underlay the 1977 policy.

The EPA has used three different metrics to compare the reactivity of a specific compound to that of ethane: (i) the reaction rate constant (known as k_{OH}) with the hydroxyl radical (OH); (ii) the maximum incremental reactivity (MIR) on a reactivity per unit mass basis; and (iii) the MIR expressed on a reactivity per mole basis. Differences between these three metrics are discussed below.

The k_{OH} is the reaction rate constant of the compound with the OH radical in the air. This reaction is typically the first step in a series of chemical reactions by which a compound breaks down in the air and participates in the ozone-forming process. If this step is slow, the compound will likely not form ozone at a very fast rate. The k_{OH} values have long been used by the EPA as a metric of photochemical reactivity and ozone-forming activity, and they have been the basis for most of the EPA’s previous exemptions of negligibly reactive compounds from the regulatory definition of VOC. The k_{OH} metric is inherently a molar comparison, i.e., it measures the rate at which molecules react.

The MIR values, both by mole and by mass, are a more recently developed metric of photochemical reactivity derived from a computer-based photochemical model. This metric considers the complete ozone forming activity of a compound on a single day, and not merely the first reaction step.

The MIR values for compounds are typically expressed as grams of ozone formed per gram of VOC (mass basis), but may also be expressed as grams of ozone formed per mole of VOC (molar basis). For comparing the reactivities of two compounds, using the molar MIR values considers an equal number of molecules of the two compounds. Alternatively, using the mass MIR values compares an equal mass of the two compounds, which will involve different numbers of molecules, depending on the relative molecular weights. The molar MIR comparison is consistent with the original smog chamber experiments that underlie the original selection of ethane as the threshold compound, in that these experiments compared equal molar concentrations of individual VOCs. It is also consistent with previous reactivity determinations based on k_{OH} values, which are inherently molar. By contrast, the mass MIR comparison is more consistent with how MIR values and other reactivity metrics have been applied in reactivity-based emission limits, such as the national VOC emissions standards for aerosol coatings (73 FR 15604). Many other VOC regulations contain limits based upon a weight of VOC per volume of product, such as the EPA's regulations for limiting VOC emissions from architectural and industrial maintenance coatings (40 CFR part 59 subpart D). However, the fact that regulations are structured to measure VOC content by weight for ease of implementation and enforcement does not necessarily control whether VOC exemption decisions should be made on a weight basis as well.

The choice of the molar basis versus the mass basis for the ethane comparison can be significant. In some cases, a compound might be considered less reactive than ethane under the mass basis but not under the molar basis. For compounds with a molecular weight higher than that of ethane, use of the mass basis results in more VOCs being classified as less reactive than ethane than does use of the molar basis.

The EPA has considered the choice between a molar or mass basis for the comparison to ethane in past rulemakings and guidance. In the Interim Guidance, the EPA stated:

[A] comparison to ethane on a mass basis strikes the right balance between a threshold that is low enough to capture compounds that significantly affect ozone concentrations and a threshold that is high enough to exempt some compounds that may usefully substitute for more highly reactive compounds.

When reviewing compounds that have been suggested for VOC-exempt status, EPA will continue to compare them to ethane using k_{OH} expressed on a molar basis and MIR values expressed on a mass basis.

The EPA's 2005 Interim Guidance also noted that concerns have sometimes been raised about the potential impact of a VOC exemption on environmental endpoints other than ozone concentrations, including fine particle formation, air toxics exposures, stratospheric ozone depletion and climate change. The EPA has recognized, however, that there are existing regulatory and non-regulatory programs that are specifically designed to address these issues, and the EPA continues to believe that the impacts of VOC exemptions on environmental endpoints other than ozone formation will be adequately addressed by these programs. The VOC exemption policy is intended to facilitate attainment of the ozone NAAQS, and questions have been raised as to whether the agency has authority to use its VOC exemption policy to address concerns that are unrelated to ground-level ozone. Thus, in general, VOC exemption decisions will continue to be based solely on consideration of a compound's contribution to ozone formation. However, if the EPA determines that a particular VOC exemption is likely to result in a significant increase in the use of a compound and that the increased use would pose a significant risk to human health or the environment that would not be addressed adequately by existing programs or policies, the EPA reserves the right to exercise its judgment in deciding whether to grant an exemption.

B. Petition to List HFO-1234ze as Exempt

Honeywell, Inc. submitted a petition to the EPA on December 2, 2009, requesting that HFO-1234ze (CAS 29118-24-9) be exempted from VOC control based on its low reactivity relative to ethane. The petitioner indicated that HFO-1234ze may be used in a variety of applications including as a refrigerant, an aerosol propellant, and a blowing agent for insulating foam. This molecule has diverse

applications including as a blowing agent for polyurethanes, polystyrene and other polymers, and as an aerosol propellant.

Honeywell submitted several documents, including several peer-reviewed journal articles, to support its petition, and we made these available in the docket for this action. These documents contained k_{OH} values and MIR reactivity rates for ethane and HFO-1234ze. This information is reproduced below in Table 2. From the data in Table 2, it can be seen that the MIR for HFO-1234ze on a grams of ozone formed per gram of VOC basis is 0.098 which is only 35 percent that for ethane at 0.28 on the same basis. However, HFO-1234ze has a higher k_{OH} value than ethane, meaning that it initially reacts more quickly in the atmosphere than ethane. A molecule of HFO-1234ze is also more reactive than a molecule of ethane, as shown by the molar MIR ($\text{g O}_3/\text{mole VOC}$) values, since equal numbers of moles have equal numbers of molecules.

Table 2 - Reactivities of ethane and HFO-1234ze			
Compound	k_{OH} ($\text{cm}^3/\text{molecule-sec}$)	MIR ($\text{g O}_3/\text{mole VOC}$)	MIR ($\text{g O}_3/\text{gram VOC}$)
Ethane	2.4×10^{-13}	8.4	0.28
HFO-1234ze	9.25×10^{-13}	11.2	0.098

Notes:

1. k_{OH} value for ethane is from: R. Atkinson, D. L. Baulch, R. A. Cox, J. N. Crowley, R. F. Hampson, Jr., R. G. Hynes, M. E. Jenkin, J. A. Kerr, M. J. Rossi, and J. Troe (2004), Summary of evaluated kinetic and photochemical data for atmospheric chemistry. The reference cited in Note 3 gives a k_{OH} value of 2.54×10^{-13} for ethane, slightly different than the value shown in the table.
2. k_{OH} value for HFO-1234ze is from: R. Sondergaard, O. J. Nielsen, M. D. Hurley, T. J. Wallington, and R. Singh, "Atmospheric chemistry of trans-CF₃CH=CHF: kinetics of the gas-phase reactions with Cl atoms, OH radicals, and O₃." Chemical Physics Letters, 443 (2007) 199–204.
3. Maximum incremental reactivity or MIR ($\text{g O}_3/\text{g VOC}$) values for ethane (page 177) and HFO-1234ze (page 201) are from: William P. L. Carter, "Development of the SAPRC-07 chemical mechanism and updated ozone reactivity scales" (updated 1/27/10).
4. Molar MIR ($\text{g O}_3/\text{mole VOC}$) values were calculated from the mass MIR ($\text{g O}_3/\text{g VOC}$) values by determining the number of moles per gram of the relevant organic compound.

III. Proposed Action and Response to Comments

Based on the mass MIR (g O₃/g VOC) value for HFO-1234ze being equal to or less than that of ethane, the EPA proposed to find that HFO-1234ze is “negligibly reactive” and to exempt HFO-1234ze from the regulatory definition of VOC at 40 CFR 51.100(s). In the proposal, the EPA noted that the EPA’s New Chemicals program under the Toxic Substances Control Act (TSCA) and the EPA’s SNAP program under the CAA have both reviewed HFO-1234ze for potential risks to human health and the environment. After considering all relevant data currently available, the EPA was unable to find any unreasonable risks to human health or the environment from the expected use of HFO-1234ze. Based on this finding, the EPA did not find it necessary to take any actions to prevent unreasonable risk under TSCA. The SNAP program has issued determinations of acceptability for HFO-1234ze as an acceptable substitute for certain ozone depleting substances in a number of foam blowing end uses, as a refrigerant in non-mechanical heat transfer and as a propellant as stated in Section I.

There were four comments submitted to the docket during the public comment period. One comment was from the petitioning manufacturer Honeywell. One comment came from a manufacturer of products containing the compound. This commenter wrote that as a manufacturer of high quality specialty chemicals and supplies for electronic maintenance and repair, it considers HFO-1234ze to be a potential alternative to products containing higher global-warming potential compounds such as HFC-134a and HFC-152a. It further stated that in order for this product to be marketed in all parts of the U.S., it is essential that it be classified as a non-VOC. Separate comments came from two trade associations. All comments were in favor of exempting HFO-1234ze. None of the comments opposed using the gO₃/g VOC basis. The one comment which addressed that issue supported the use of the MIR on a gO₃/g VOC basis for granting exemptions.

IV. Final Action

The EPA is amending its definition of VOC at 40 CFR 51.100(s) to exclude HFO-1234ze as a VOC for ozone SIP and ozone control purposes. States are not obligated to exclude HFO-1234ze from control as a VOC. However, states may not take credit for controlling HFO-1234ze in their ozone control strategies.

In our October 17, 2011, proposal (76 FR 64059), we also proposed to exempt 2,3,3,3-tetrafluoropropene (also known as HFO-1234yf) from the definition of VOC. We are not taking final action on that proposal at this time.

V. Statutory and Executive Order Reviews

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

This action is not a "significant regulatory action" under the terms of Executive Order 12866 (58 FR 51735, October 4, 1993) and is therefore not subject to review under Executive Orders 12866 and 13563 (76 FR 3821, January 21, 2011).

B. Paperwork Reduction Act

This action does not impose an information collection burden under the provisions of the Paperwork Reduction Act, 44 U.S.C. 3501 et seq. Burden is defined at 5 CFR 1320.3(b). It does not contain any recordkeeping or reporting requirement.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the final rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions. For purposes of assessing

the impacts of this notice on small entities, small entity is defined as: (1) A small business that is a small industrial entity as defined in the U.S. Small Business Administration (SBA) size standards. (See 13 CFR 121.201); (2) A governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) A small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of this final rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. This final rule will not impose any requirements on small entities.

D. Unfunded Mandates Reform Act

This action contains no federal mandates under the provisions of Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), 2 U.S.C. 1531-1538 for state, local or tribal governments or the private sector. The action imposes no enforceable duty on any state, local or tribal governments, or the private sector. Therefore, this action is not subject to the requirements of sections 202 and 205 of the UMRA.

This action is also not subject to the requirements of section 203 of UMRA because it contains no regulatory requirements that might significantly or uniquely affect small governments.

E. Executive Order 13132: Federalism

This action does not have federalism implications. It will not have substantial direct effects on the states, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. This action addresses the exemption of a chemical compound from the VOC definition. Thus, Executive Order 13132 does not apply to this rule.

F. Executive Order 13175: Consultation and Coordination with Indian Tribal Governments

This action does not have tribal implications, as specified in Executive Order 13175 (65 FR 67249, November 9, 2000). It will not have substantial direct effects on tribal governments, on the relationship between the federal government and Indian tribes, or on the distribution of power and responsibilities between the federal government and Indian tribes as specified in Executive Order 13175. Thus, Executive Order 13175 does not apply to this rule.

G. Executive Order 13045: Protection of Children from Environmental Health and Safety Risks

This action is not subject to EO 13045 (62 FR 19885, April 23, 1997) because it is not economically significant as defined in EO 12866. While this final rule is not subject to the Executive Order, the EPA has reason to believe that ozone has a disproportionate effect on active children who play outdoors (62 FR 38856; 38859, July 18, 1997). The EPA has not identified any specific studies on whether or to what extent this chemical compound may affect children's health.

H. Executive Order 13211: Actions that Significantly Affect Energy Supply, Distribution, or Use

This action is not a “significant energy action” as defined in Executive Order 13211, “Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use” (66 FR 28355, May 22, 2001) because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. This action revises the EPA's definition of VOCs for purposes of preparing SIPs to attain the NAAQS for ozone under title I of the CAA.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 ("NTTAA"), Public Law 104-113, section 12(d), (15 U.S.C. 272 note) directs the EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures and business practices) that are developed or adopted

by voluntary consensus standards bodies. The NTTAA directs the EPA to provide Congress, through OMB, explanations when the agency decides not to use available and applicable voluntary consensus standards. This action does not involve technical standards. Therefore, the EPA is not considering the use of any voluntary consensus standards.

J. Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order (EO) 12898 (59 FR 7629, Feb. 16, 1994) establishes federal executive policy on environmental justice. Its main provision directs federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies and activities on minority populations and low-income populations in the United States.

The EPA has determined that this final rule will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it will not affect the level of protection provided to human health or the environment.

K. Congressional Review Act

The Congressional Review Act, 5 U.S.C. 801 et seq., as added by the Small Business regulatory Enforcement Fairness Act of 1996, generally provides that before a rule may take effect, the agency promulgating the rule must submit a rule report, which includes a copy of the rule, to each House of Congress and to the Comptroller General of the United States. Section 804 exempts from section 801 the following types of rules: (1) Rules of particular application; (2) rules relating to agency management or personnel; and (3) rules of agency organization, procedure or practice that do not substantially affect the rights or obligations of non-agency parties, 5 U.S.C. 804(3). The EPA is not required to submit a

rule report regarding this action under section 801 because this is a rule of particular applicability to manufacturers and users of these specific exempt chemical compounds. This action is not a “major rule” as defined by 5 U.S.C. 804(2). This rule will be effective on **[INSERT DATE 30 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER]**.

L. Judicial Review

Under section 307(b)(1) of the CAA, petitions for judicial review of this action must be filed in the United States Court of Appeals for the District of Columbia Circuit Court within 60 days from the date the final action is published in the Federal Register. Filing a petition for review by the Administrator of this final action does not affect the finality of this action for the purposes of judicial review nor does it extend the time within which a petition for judicial review must be final, and shall not postpone the effectiveness of such action. Thus, any petitions for review of this action related to the exemption of HFO-1234ze from the definition of VOC must be filed in the Court of Appeals for the District of Columbia Circuit within 60 days from the date final action is published in the Federal Register.

List of Subjects in 40 CFR Part 51

Environmental protection, Administrative practice and procedure, Air pollution control, Ozone, Reporting and recordkeeping requirements, Volatile organic compounds.

Dated: June 7, 2012

Lisa P. Jackson,
Administrator.

For reasons set forth in the preamble, part 51 of chapter I of title 40 of the Code of Federal Regulations is amended as follows:

PART 51-REQUIREMENTS FOR PREPARATION, ADOPTION, AND SUBMITTAL OF
IMPLEMENTATION PLANS

1. The authority citation for Part 51, Subpart F, continues to read as follows:

Authority: 42 U.S.C. 7401, 7411, 7412, 7413, 7414, 7470-7479, 7501-7508, 7601, and 7602.

§ 51.100 [Amended]

2. Section 51.100 is amended at the end of paragraph (s)(1) introductory text by removing the words “and perfluorocarbon compounds which fall into these classes:” and adding in their place the words “trans-1,3,3,3-tetrafluoropropene; and perfluorocarbon compounds which fall into these classes:”.

[FR Doc. 2012-15347 Filed 06/21/2012 at 8:45 am; Publication Date: 06/22/2012]